Luke Zimmerman

Astronomers measure an star with an apparent V-band magnitude of $m_v = 19.4$ in the Andromeda Galaxy. If this star were a cepheid star, what would it's Period be?

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The distance to Andromeda is $d = .77 Mpc$

Using the distance modulus we can compute the stars Absolute Magnitude $M_v$ $\quad m - M = 5 \log_{10}(d\,[Pc]) - 5$

$\Rightarrow M_v = m_v - 5\log(d) + 5 = 19.4 - 5\log(770{,}000\ pc) + 5 = -5.03$

Then, using the Period, luminosity relation for Cepheid Stars, we can find the Period

$$M_v = -2.678 \log_{10}(P\,[days]) - 1.00$$

$$\Rightarrow \frac{M_v + 1.00}{-2.678} = \log_{10}(P\,[days])$$

$$\Rightarrow P\,[days] = 10^{\left[\frac{M_v + 1}{-2.678}\right]} = 10^{\left[\frac{-5.03 + 1}{-2.678}\right]} = 322.0 \text{ days}$$